DOCUMENT RESUME

ED 430 494 HE 032 085

AUTHOR Davis, Denise D.
TITLE The Research Apprenticeship Program: Promoting Careers in Biomedical Sciences and the Health Professions for Minority Populations.
PUB DATE 1999-04-00
NOTE 30p.; Paper presented at the Annual Meeting of the American Educational Research Association (Montreal, Ontario, April 19-23, 1999).
PUB TYPE Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Allied Health Occupations Education; *Apprenticeships; College Bound Students; Experiential Learning; Health Occupations; High School Students; High Schools; Higher Education; *Minority Groups
IDENTIFIERS *Ohio State University

ABSTRACT

This study examined the career decisions of 54 high school students who participated in the Research Apprenticeship Program (RAP) at Ohio State University during 1990-92. RAP is a precollege program which aims to provide meaningful experiences in various aspects of health-related research for minority high school students and teachers. RAP activities are centered on the assignment of students to faculty preceptors/mentors during eight weeks in the summer. Participants work as full-time apprentices and participate in various career development activities, including maintaining a written record of their experience, conducting a research project in their assigned health area, and participating in a science fair. Data on 54 former participants were collected concerning the precollege program experience, student background characteristics, and individual factors (such as academic ability, personality, and motivation). Of the respondents, 37 (68 percent) had chosen to pursue a health profession immediately following high school, and 17 percent (32 percent) had decided not to pursue a health professional immediately following high school. Analysis indicated that personality, cognitive, and motivational factors, along with family characteristics, experiential learning, socioeconomic status, and the RAP program had a significant impact on the career decision-making process of these students. (Contains 33 references.) (DB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

AE

ED 430 494

The Research Apprenticeship Program: Promoting Careers in Biomedical Sciences and the Health Professions for Minority Populations

Presented at The AERA: American Educational Research Association's Annual Meeting, April, 1999, Montreal Canada

Session 6.55: ***Cognitive Aspects of Career Development***

BEST COPY AVAILABLE

Denise D. Davis
Cultural Studies in Education
The Ohio State University
1051 West Second Avenue
Columbus, Ohio 43212
614-294-2441

IAE032085

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY

Denise D. Davis

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Abstract

Colleges and universities provide a valuable link between minority high school students and health related careers. Many colleges utilize precollege internships and apprenticeships to foster the career development process for underrepresented populations. This study examined the career decisions of fifty-four high school students who participated in the Research Apprenticeship Program (RAP), a precollege program, at the Ohio State University during 1990-1992. Findings indicated that Personality/cognitive/motivational factors, along with family characteristics, experiential learning, socioeconomic status, and the RAP program had a significant impact on the career decision making process of minority high school students interested in health or bio-medical careers.

Minority representation in health care fields remains low, and minority membership in prestigious scientific and academic societies, such as the American Society for Clinical Investigation and the American Association of Physicians, is relatively nonexistent. The number of minorities graduating from medical schools is approximately 12%, in comparison to 10% in 1982, and 8% in 1978 (Watts & Lecca, 1987, & Malcom, 1996). African-Americans, Hispanics, and other minorities are also severely underrepresented in research careers. African-Americans comprise only 2% of all scientists and engineers, and represent only 1.3% of the population with doctoral degrees in the biological sciences. Hispanics represent only 2.8% of the degree recipients in the biological sciences (AAMC, 1995). In the past 25 years, solutions to the problem of underrepresentation have been modest, and today, the programs and organizations that have facilitated these modest gains are in danger. Recent Supreme court rulings and proposed/passed legislation in opposition to affirmative action threaten to eliminate the policies and practices that have promoted diversity, equal opportunity, and education (Malcom, 1996; & Kasindorf, 1999).

The problem of underrepresentation begins early and is often intertwined with socioeconomic conditions. After high school, the financial burden posed by a college education precludes many minority students from pursuing degrees in the sciences and health professions (AAMC, 1995). Colleges and Universities establish a vital link between minorities and the health care professions by providing access, opportunity, and development. Strategies utilized by many colleges and universities include the implementation of precollege internships, apprenticeships, and fieldwork experiences. Numerous studies demonstrate that the students who participate in these types of precollege programs derive many benefits that enhance the career decision-making

process. In previous research, experiential precollege science programs for talented students have been found to generate increased academic and career opportunity (Pizzini and Moore, 1984).

The purpose of this study was to investigate factors affecting the career decision-making process of minority high school students who participated in a precollege apprenticeship program in the health sciences. This was accomplished through differentiating between two types of minority students: those who decided to pursue a health profession and those who decided not to pursue a health profession immediately following high school. These students participated in a precollege program -- the Research Apprenticeship Program (RAP) at The Ohio State University during the years of 1990-1992. Overall, this study investigated the impact that this precollege program had on the career choices of its participants and the impact that their individual qualities and background characteristics had on career decisions. It attempted to better understand the career development of minority populations. In principle, this type of information can be useful in planning social and institutional strategies to increase opportunities for minority populations in the health fields.

Program Description

At The Ohio State University, the Research Apprenticeship Program's (RAP) design was influenced by the goals of the AAMC (Association of American Medical Colleges) to make medical education accessible to all segments of society through the inauguration of *Project 3,000 by 2,000,* which emphasized the increased participation of minority populations in medical fields. The Ohio State University RAP program was supported by a grant from the National Institutes of Health and the National Center for Research Resources (NCRR) (Higgins, 1991). The NCRR Minority Initiative funded more than 2,374 students and 522 science teachers in 1994 alone, and

has benefited more than 24,000 students nationwide since 1980. The purpose of the RAP program during the years 1990-1992 was to provide a meaningful experience in various aspects of health related research for minority high school students and teachers. It was anticipated that such experiences would foster in each participant an interest in pursuing further study and/or a career in the health professions (Office of Minority Affairs, 1993).

In the past, students have qualified for this program through enrollment in high school at the 11th and 12th grade levels and by having grade point averages of 3.0 or above (Higgins, 1991). Minority participants were defined by NCRR as: Black/African-American, Hispanic, Native American, or Asian American/Pacific Islander. Health Colleges who have previously participated in the program are: Dentistry; Pharmacy; Medicine and Public Health; Nursing, Food, Agriculture, & Environmental Sciences; Biological Sciences; and Veterinary Medicine.

RAP activities were centered on the assignment of students to faculty preceptors/mentors during eight weeks in the summer. Participants worked as full-time apprentices and participated in various career development activities. Apprentices maintained a written record of their experience and conducted a research project in their assigned health area. At the conclusion of the program a science fair was held, where research apprentices co-presented their projects with their faculty mentors. Overall, the apprentices were actively involved with experts in bio-medical and health related research on a daily basis.

Methods

This study addressed four main hypothesis statements:

1. Students who decided to pursue a health profession immediately following high school will significantly differ from students who did not decide to pursue a health profession.

2. Students who decided to pursue a health profession immediately following high school will more highly value their experience in the Research Apprenticeship Program (RAP) than students who did not decide to pursue a health profession.

3. Students who decided to pursue a health profession immediately following high school will differ from students who decided not to pursue a health profession in terms of background characteristics.

4. Students who decided to pursue a health profession immediately following high school will differ in terms of their individual characteristics from students who did not choose to pursue a health profession.

Within these hypotheses, nine variables were divided into three categories and were explored as factors differentiating between participants and as variables influencing the career decision-making process. These categories included: 1.) Precollege Program -- experiential learning (EXPL) and mentoring; 2.) Background Characteristics -- socioeconomic status (SES), race, family, high school attended, and gender; and 3.) Individual Factors -- academic ability, and personality/cognitive/motivational (PCM).

Several quantitative methods were used in this study. A multivariate discriminant analysis (MDA) was utilized to differentiate between the two groups on their total performance on the selected variables, rather than on each variable separately. In other words, it was used to analyze differences on the whole rather than in terms of the components (DCosta, 1968). A multiple analysis of variance (MANOVA) was also used to detect differences between the groups. This type of analysis minimized the risk of type-I error, which is often present when using multiple t-tests. This method provided for an analysis of both, the whole and individual components (Hopkins, Hopkins & Glass, 1996). Finally, other descriptive statistics were used to examine measures of central tendency and analysis of variance between groups. These methods allowed the researcher to accurately describe the sample and its defining characteristics in order to differentiate among career choice groups.

Data Collection

Data were collected using a questionnaire consisting of 38 response items. The questionnaire was developed by the researcher and contained three sections: RAP Experience, Career Decision, and Personal Background. Questions were tested for reliability using a Cronbach's Alpha. Alpha levels for continuous response items were .94 for the RAP Experience section and .7 on the Personal Background section. Data were also collected from the RAP office files and short telephone interviews. The telephone interview script consisted of a shortened version of the questionnaire, and contained 15 questions.

In May, 1996, two questionnaire mailings were sent to 117 former RAP participants. Questions that were most related to the hypotheses and research questions were then chosen for the telephone interview. A question regarding peer interaction was also selected. The researcher conducted all telephone interviews with former participants who did not respond to two questionnaire mailings.

Sample and Population

The sample was *purposive*, targeted by the researcher to have certain desirable characteristics. Specifically, as former 1990-1992 RAP participants at Ohio State, these students had high academic ability, some interest in pursuing a health profession, and belonged to a racial minority group. These variables were controlled for in the initial program selection.

The sample of respondents adequately reflected the total RAP population by gender, race, and type of high school attended (see Table 1). The total population of participants was 87 (N=87). The total number of respondents was 54 (n=54). These respondents consisted of 37 students who returned questionnaires and 17 who responded to the telephone interview. The total response rate was 63%. Of the respondents, 37 (68%) had chosen to pursue a health

profession immediately following high school, and 17 (32%) had decided not to pursue a health profession immediately following high school.

Category	*Total*	*Gender*		*Race* (6 missing data, 7%)				*High School*			
		M	*F*	*Af-Am*	*Nat-Am*	*As-Am*	*Hisp*	*U-Pub*	*S-Pub*	*U-Pri*	*S-Pri*
Total (N) Population	87	21 24%	66 76%	59 68%	1 1%	17 20%	4 5%	48 55%	21 24%	14 16%	4 5%
Total (n) Sample	54	10 19%	44 81%	40 74%	1 2%	11 20%	2 4%	29 54%	16 27%	5 9%	4 7%
Phone Interview	17	4 24%	13 76%	16 94%		1 6%		14 82%	2 12%	1 6%	
Returned Quest.	37	6 16%	31 84%	24 65%	1 3%	10 27%	2 5%	15 41%	13 35%	5 14%	4 11%
Did not Respond	33	11 33%	22 66%	23.4 71%		7.3 22%	2.3 7%	19 58%	6 18%	8 24%	
Yes to Health Profession	37	8 15%	29 54%	26 48%		10 19%	1 2%	19 35%	11 20%	5 9%	2 4%
No to Health Profession	17	2 4%	15 28%	14 26%	1 2%	1 2%	2%	10 19%	4 7%	1 2%	2 4%

Table 1: Demographic Information

Results

Results of the hypotheses testing demonstrated that Hypothesis I, Hypothesis II, Hypothesis III, and Hypothesis IV were supported, at least partially, by the statistical results. Findings indicated that there was an overall difference between the two career choice groups.

Hypothesis I

The first hypothesis stated that students who decided to pursue a health profession immediately following high school would significantly differ from students who did not decide to pursue a health profession. Using all nine variables, the MDA produced a Wilks' Lambda value of .3562, and a Chi-Square value of 41.807, with 9 degrees of freedom. The Wilks'

Lambda for the above listed factors was significant at the .000** level. Therefore, the two groups were found to be significantly different. This analysis supported Hypothesis I.

The classification of subjects by the MDA can be found in Table 2. These findings indicated that the percent of "grouped" cases were correctly classified at a rate of 93.6%. From the group of subjects that did not decide to pursue a health profession, 91.7% were correctly classified. From the group of subjects that did decide to pursue a health profession, 94.3% were correctly classified. This result demonstrated a high level of accuracy in prediction, and further supported the hypothesis that these two groups of subjects could be significantly differentiated.

Actual Group	No. of Cases	Predicted Group Membership: 0	Predicted Group Membership: 1
Did Not Choose Health Field	12	11 91.7%	1 8.3%
Did Choose Health Field	35	2 5.7%	33 94.3%

Table 2: Classification of Subjects

Multiple Analysis of Variance

A multiple analysis of variance (MANOVA) was also conducted using the same selected variables (n = 47). Similar results were reported in regard to Hypothesis I. The MANOVA demonstrated that the two groups of subjects were significantly different (S = 1, m = 3 1/2, N =17 1/2). The Wilks' Lambda was .3562, with degrees of freedom at 9, and a level of significance at .000** . This result further supported Hypothesis I.

Univariate ANOVAs

Univariate F-tests, ANOVAs, (1, 45; degrees of freedom) were conducted to determine the significance of each selected variable (see Table 3). Three variables were found to be significantly different between the groups at the .05 Alpha level. These variables were PCM (F

(1, 45) = 37.19, p = .000**), Family (F(1, 45) = 13.29, p = .001**), and EXPL (F (1, 45) = 12.29, p = .001**). One value was found to be significant at the .10 Alpha level. This variable was SES (F (1, 45) = 3.77, p = .058*). The remaining variables did not differ significantly between the two groups.

Variable	F Value	Significance of F
PCM	37.19	.000**
Family	13.29	.001**
EXPL	12.29	.001**
SES	3.77	.058*
Mentoring	1.91	.173
Gender	1.19	.280
Race	.31	.579
High School	.09	.764
Academic Ability	.02	.892

**Statistically Significant at the .05 Level
* Statistically Significant at the .10 Level

Table 3: Univariate F-tests

Hypothesis II

Hypothesis II stated that students who decided to pursue a health profession immediately following high school would more highly value their experience in the Research Apprenticeship Program (RAP) than students who did not decide to pursue a health profession. The RAP program was characterized by two main elements, EXPL (apprenticeship) and mentoring. These two elements were tested, and the hypothesis was supported for the EXPL variable only. Mentoring was not found to be a significant factor. Although the mean value for the group who chose to pursue a health profession (3.6) was slightly higher than the mean score of the group who did not chose to pursue a health profession (3.1). The EXPL means were significantly different between the two groups (F (1, 45) = 37.19; p = .000**). This analysis supported Hypothesis II.

Hypothesis III

Hypothesis III stated that the two student groups would have different background characteristics. Of the five background factors, two were found to be significant, family and SES. Hypothesis III was not supported by the findings from the testing of gender, race, and high school attended.

In terms of the family factor, results indicated that there was a significant difference between groups. The mean for students who decided to pursue a health profession was 4.34 (SD = 1.07). Whereas, the mean for students who did not decide to pursue a health profession was 3.25 (SD = .82). The ANOVA reported statistically significant results ($F(1, 45) = 13.29$; $p = .001^{**}$) differentiating between the two groups. This analysis supported Hypothesis III. Mean family levels of education for both groups was 14.5 years of schooling for both parents combined. Family educational levels were not a distinguishing factor.

In terms of SES, results of the ANOVA indicated that there was a significant difference between these two groups in regard to SES at the .10 level. The mean score for those who decided to pursue a health profession was 48,690 (SD = 17,063). Where the mean score for those who decided not to pursue a health profession was 35,885 (SD = 20,487). The total standard deviation score for each group was high, and caution was taken in interpreting the results. The difference of SES between the two groups was significant but not as significant as the family variable ($F(1, 45) = 3.77$, $p = .058^{*}$) This analysis supported Hypothesis III.

Hypothesis IV

Hypothesis IV stated that the two student groups would differ in terms of their individual characteristics. This hypothesis was found to be statistically significant in regard to the PCM factor but not for academic ability. Results of the ANOVA indicated that the two groups of

subjects differed significantly on the PCM variable (F (1, 45) = 37.19; p = .000**). The mean score of students who decided to pursue a health profession was 4.32 (SD = .67). The mean score for students who decided not to pursue a health profession was 3.17 (SD = .52). This variable was found to be the most statistically significant factor to differentiate between the two groups. These results supported Hypothesis IV.

Exploratory Analysis

Two exploratory analyses were conducted separately and were found to produce significant results -- the overall RAP experience and the impact of peer interaction within the RAP program. In a t-test of Hypothesis II, all of the mean scores pertaining to the RAP program were grouped together. Some of these questions covered information beyond experiential learning and mentoring, and included questions on the overall program rating and the experience that subjects had with other RAP students. A One-way ANOVA was conducted using the grouped mean (n = 53). The ANOVA produced a statistically significant result (F (1, 45) = 10.75, p = .0019**). Therefore, students belonging to the two career choice groups significantly differed in their rating of the value of the program as a whole. This analysis supported Hypothesis II.

The value of peer interaction was also found to significantly differentiate between the two groups (n = 47). The average score for those who decided to pursue a health profession was 2.73 (SD = 1.39). The average score for students who decided not to pursue a health profession was 1.82 (SD = 1.23). The reported t-value was 2.24, which was statistically significant at the level of .030**. This analysis supported Hypothesis II.

Overall, results of the hypotheses testing demonstrated that Hypothesis I, Hypothesis II, Hypothesis III, and Hypothesis IV were at least partially supported. Findings indicated that there

was an overall difference between the two career choice groups. Four factors were found to significantly differentiate between the two groups: personality/cognitive/motivational factors (PCM), family characteristics, experiential learning (EXPL), and socioeconomic status (SES). In exploratory analyses, an overall rating of the RAP program and the effect of peer interaction within the program were also found to be significant.

Discussion

Following MDA and MANOVA testing, the two career choice groups were found to differ significantly. This result was the most important finding in the study, because it enabled the researcher to further explore the characteristics that individually differentiated between the two groups. Many theorists hypothesize that multiple factors affect career decision-making, and the theorists also assert that these qualities are both, personal and social (Crites, 1969; Roe, 1957; Super, 1957). One of the oldest career development theories, the trait factor theory, emphasizes differences between personality traits (attitude, ability, and interest) and social factors that can either hinder or facilitate choice. Holland's theory of career development states that a person expresses personality through the choice of vocation. His theory also focuses on the importance of environment, maturity, and social class. O'Neil and others (1980) accentuate the impact of individual, societal, familial, SES, situational, and psychosocial emotional factors on the career decision-making process. These theories support the underlying notion that those who pursue a particular profession will share certain personal and social qualities (Isaacson & Brown, 1993). However, they do not specifically focus on the impact of a precollege apprenticeship program experience.

Career Decision Making Model

The background literature and results found in this study illuminate the importance of examining background characteristics, individual factors, and precollege programs in relation to the career decisions of minority high school students. At the beginning of the study, a model for career decision-making was created by the researcher that was based on the review of the literature, as seen in Figure 1. However, from reviewing the results presented in this study some adjustments were made to this model and can be seen in Figure 2.

The study's findings allowed for several driving forces to emerge from the literature; for example, family became a more significant factor among the background characteristics. Experiential learning became the dominant factor within the precollege program category. PCM factors became salient among the individual components. Lastly, peer interaction was added to the precollege program category as an influential characteristic. Students with high SES, high family values and expectations, strong experiential learning, positive peer interactions, and a personality/cognitive/motivational orientation toward the sciences were more likely to choose a health profession than students who did not posses these qualities and characteristics.

Driving Forces

Overall, the driving forces of the Career Decision-Making Model found in Figure 2 represent the characteristics that most significantly differentiated between the two career choice groups and also served as the highest predictors of group membership. PCM factors, family, EXPL (apprenticeship), and SES, along with the overall RAP experience and peer interaction were the most salient variables affecting the decisions of minority high school students who participated in this program.

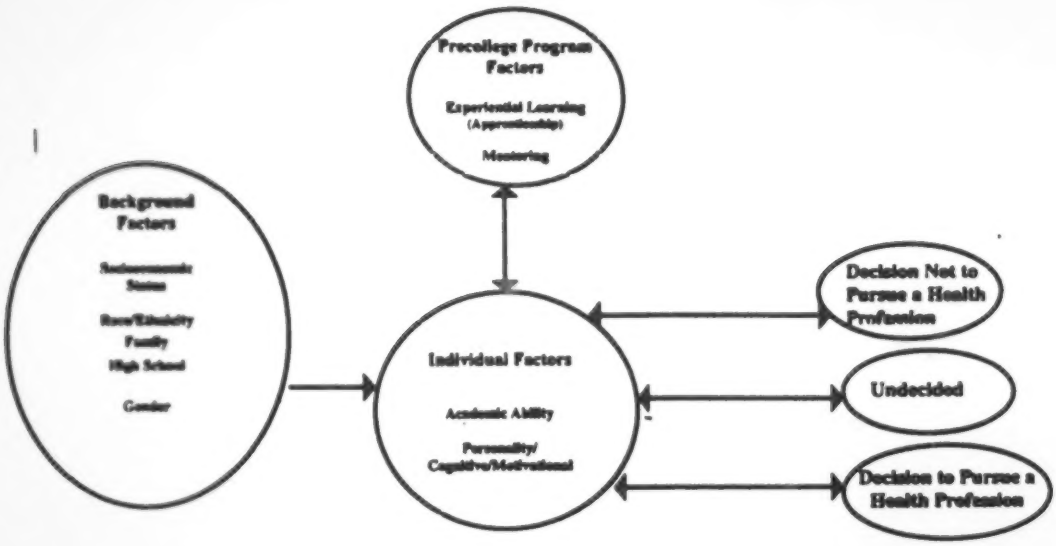

Figure 1: Factors Influencing Career Decision-Making

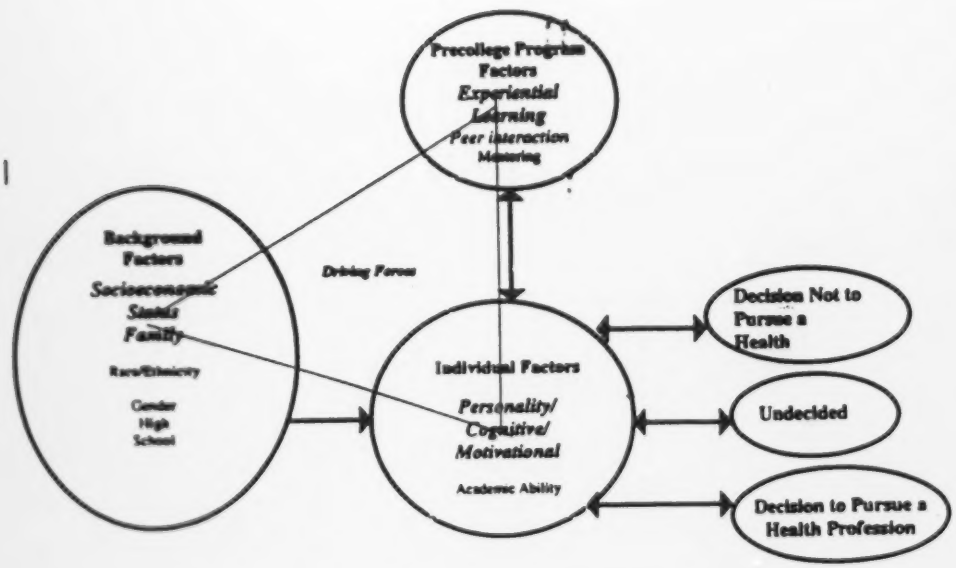

Figure 2: Career Decision-Making Model

BEST COPY AVAILABLE

Personality/Cognitive/Motivational (PCM) Characteristics

PCM factors (Personality/cognitive/motivational) had the highest level of significance for differentiating between the career choice groups in the study. Most career decision-making theory implicates individual interests, abilities, and personalities as having the most significance on the career choice process (Holland, 1973; Rovezzi-Caroll & Fitz, 1984; Roe, 1953, Super, 1957). This study confirmed many of these theories.

A great number of career development and psychological theorists believe that people who train for specific professional fields represent the field in terms of personality and social characteristics (Rovezzi-Caroll & Fitz, 1984). Hilton and others (1988) found that persisters in science careers were high in "science motivation". This result corresponded with the results in this study. The RAP students who chose to pursue a health profession rated themselves as being more highly motivated than students who did not chose to pursue a health profession. These students also rated themselves as being well suited for health science or medical research work. They ranked themselves more highly in receiving pleasure through participation in scientific work than those who did not choose to pursue a health profession after high school. These students were high in "scientific motivation".

Kolb (1984) suggests that professional career choice assists in the shaping of learning styles. He theorizes that through career choice one becomes a member of a reference group of peers who share a *professional mentality,* a common set of values and beliefs about how one should behave professionally. Students in this study who decided to pursue health careers shared the same goals and values with other RAP participants to a higher degree than those who did not choose to pursue a health profession. Overall, students who chose to pursue health professions significantly differed in their PCM qualities from students who did not choose to pursue health

professions. These findings adequately supported approximately 45 years of career development theory.

Family

The family factor was defined in terms of career and academic expectations and also the value placed on attaining a health career. In this study, student ratings on this factor significantly differed between those who decided to pursue a health profession and those who did not. Super (1957) strongly emphasized the importance of the family in his career development theory and defined it as a social, psychological, and economic entity. O'Neil and others (1980) defined the family factor as, "values, attitudes, and behaviors that are shaped through family experiences". These definitions strongly influenced the direction that the researcher took in this study regarding family issues.

In open-ended responses, 6 out of 15 students named "parents" or "mothers" as the person(s) who helped them make plans to pursue a health profession. These findings supported results of other studies that family is an important factor in the career decision-making process (O'Neil et.al., 1980; Super, 1957; Bauman, 1986). However, in exploratory analyses, the correlation between family values/expectations and mother and father levels of education demonstrated a weak relationship. SES and the family factor also demonstrated a weak relationship. Therefore, SES and level of education were not related to the family's expectations and values. More highly educated or wealthy parents did not necessarily have higher academic and career expectations for their children, nor did they value the attainment of a health profession more than parents with lower educational levels and a lower SES. However, RAP students from wealthier families were still more likely to pursue a health profession.

Experiential Learning (EXPL)

Experiential learning (EXPL) was found to be highly significant in differentiating between the two career-choice groups. Apprentices worked alongside "masters" of medicine and bio-research in order to gain career and academic skills. This factor had two types of effects on students. In open ended responses, both groups of students referred to EXPL and "hands on" learning as a "powerful learning experience." However, students who decided to pursue a health profession rated the impact of EXPL on their career choice much higher than students who did not decide to pursue a health profession. Many students did not find the experience to be a "good fit" and concluded that another profession was more appropriate. Most students who decided to pursue a health profession referred to the program as a type of "stepping stone" to a health career.

Previous literature and research support these findings. Kolb (1984) describes EXPL as holistic, integrative learning that combines experience, perception, cognition, and behavior. He explains that learning, change, and growth are best facilitated by "here and now" experience. Through EXPL in RAP, students learned about their strengths, weaknesses, skills, and interests. This process of learning helped some students to conclude that they were talented and interested in the health field, while others discovered that they were better suited for other occupations. Kolb suggests that learning is created through the transformation of experience. RAP apprentices learned a substantial amount about science and medicine; however, self-transformation through experience was the most significant type of learning that took place. In a previous study, Pizzini (1984) found that students reported a change in their self-concept and their performance capabilities as a result of experience in a research-science based training

program. In the current study, open-ended responses and statistical results supported these findings.

Socioeconomic Status (SES)

Background factors have often been examined in relation to career decision-making. Among the background characteristics in this study, only family and SES were found to be statistically significant. O'Neil and others (1980) have also found family and SES to be significant factors related to this process. SES was measured in this study by family income level during the apprentice's participation in the RAP program. The average yearly income for student's families who decided to pursue a health profession was $48, 690, and the average SES for the families of students who did not decide to pursue health profession was $35,885. The combined mean was $42,000.

Drastic differences can be seen in the SES levels of RAP participants in comparison to average minority populations. In 1985 the mean SES for minority SAT-takers was $27,000 a year. This average was only $25,800 for African-American students and $19, 526 for Hispanics (Ramist & Arbeiter, 1986). In 1991, the median household income for African-American families in the U.S. was $19, 953 (U.S. Bureau of the Census, 1993). There was almost a $22,000 difference between the 1985 figure for African-Americans and the mean income figure for 1990-1992 participants who decided to pursue a health profession. The combined average income of all respondents was more than twice as high as the median income for African-American households in 1991. Overall, the mean income of RAP participants was notably higher than the general population of African-Americans and Hispanics.

The families of RAP participants had higher income levels than students of "average" minority groups. The RAP students were also a high ability group with high grade point

averages (mean = 3.4). Typically, students with high scores on standardized tests and high grade point averages come from families with higher incomes (Hilton et.al., 1988). This finding concurs with previous literature that suggests that academic ability and career choice are often tied to SES. Through selecting high ability students for the program, participants may then have had higher SES levels; however, income levels were still a relevant factor differentiating between groups.

Overall RAP Experience & Peer Interaction

The overall RAP experience and peer interaction were also found to be significant factors differentiating between the two career choice groups. Apprentices who chose to pursue a health profession rated the influence of other RAP participants as significantly higher than those who did not decide to pursue a health profession. Many of the students who decided to pursue a health profession stated that it was encouraging to meet other minorities with similar interests and goals. One student stated that spending time with other RAP participants helped her to persist in a medical field. She wrote, "we were all there because we wanted to go to college." O'Neil and others (1980) have also found peer influence to be an influential factor facilitating career choice.

Other Relevant Factors

In addition to the *Driving Forces* of the Career Decision-Making Model, other characteristics emerged from the literature and participant responses that lead to the inclusion of the following *Other Relevant Factors*. These factors did not produce statistically significant results in the hypothesis testing; however, they still played an important role in the overall decision-making processes of participants. These factors included mentoring, gender, race, high school, and academic ability.

Mentoring

Mentoring was examined as an influential component of the RAP program. Although this term is often found to be ambiguous, mentors were defined in this study as career and academic role models, providing RAP participants with support and encouragement. In RAP, students were paired with experienced medical researchers with whom they had daily contact. Students who decided to pursue a health career as opposed to those who did not rated this experience slightly higher. Mentoring was expected to be a factor that significantly divided these two groups, but the results on this finding were not statistically significant. Each group rated their mentoring experience as slightly above average, indicating that both groups had a positive mentoring experience.

This lack of statistical significance is inconsistent with previous research and literature. Many theorists have found mentoring to be a significant factor influencing the career-decisions of students. Bauman (1986) concluded that mentoring is even more crucial when a young person is characterized as "promising" or "valuable", such as the students found in RAP. Valverde (1980) found that mentoring was crucial in the development of ethnic and racial minority researchers. Some open-ended responses supported this literature, but the results were not significant. One student mentioned that she continued to conduct research with her faculty preceptor after the program ended, and that they recently published an article together. Five other students stated that their faculty preceptor had assisted them in making plans to pursue a health career. Although mentoring did not differentiate between these two groups, it was referred to positively in the open-ended responses. This finding was supported by the literature.

Gender

Gender was not found to significantly differentiate between the two career choice groups. In fact, the majority of participants in RAP were women, accounting for 81% of the sample. These findings demonstrated that many minority females were not only interested but also seriously pursuing careers in the health professions. From these findings, we can see a drastic difference from the 1951 findings of Ginzberg and others, who suggested that the career development of women was significantly different from the career development of men due to the difference in their "primary focus"-- marriage and family. Today, other researchers are also finding that gender is not a significant factor affecting the career decision-making process (O'Neil et. al., 1980; Malcom, 1996, Sonnert & Hilton, 1994). Researchers suggest that the low numbers of women in science or medical careers is not one of "shortage" or of lack of interest, but of "access" (Malcom, 1996).

Race

Race did not differ between the two career choice groups and was not found to be a significant factor in this study. Seventy-four percent of students in this sample identified as African-American. In studies conducted by other researchers, race was also found to be an insignificant factor for shaping career decision-making (O'Neil et.al., 1980; & Hilton et.al. 1988). This finding could be explained by the fact that issues of race and SES are often found to be confounding and confusing by researchers (Valentine, 1968). Minority groups are often disproportionately represented among lower income groups. They often lack opportunity and access to certain careers, mostly due to financial or SES reasons (Blau & Duncan, 1967). Participants in this study, however, had incomes that were higher than average. Therefore, SES may have been a factor that affected how the variable of race impacted the career decision making process.

High School

Fifty-four percent of students in this study attended major urban high schools. The media and others have often reported that urban-city schools provide poor education for minority youth. To a great extent urban-public schools fail many children (Kozol, 1992). Some believe that American public schools do not produce enough minority students prepared for "top-tier" universities (Morganthau, 1995). Others have reported that urban-public schools are dilapidated, crowded, inadequate, and under-funded (Kozol, 1992; Wise & Gender, 1989). With all of this negative reporting surrounding urban schools, one would predict that the type of high school attended would be a significant factor related to career choice. Many have assumed that students who attended urban schools would leave with academic deficiencies (Huttlinger & Drevdahl, 1994). The range of high school type in this study was from suburban private to urban public. However, the two groups of RAP participants were not significantly differentiated on this factor.

This finding can be examined from two perspectives. First, the RAP population had a higher yearly income level and academic ability level than typical minority groups. These factors may have played more of a role in the decision-making process than the type of school a student attended. The RAP population had an average grade point average of 3.4. The students' high school environment, if negative, did not have an effect on their performance or achievement. These students continued to do well in science and math, and they maintained high GPAs. Thus, by controlling for the factors of academic ability and SES, the researcher may have eliminated the effect of high school type.

The statistical insignificance of this factor may also have been related to the impact of the family. The influence of the family may have outweighed the effect of the type of high school. Nevertheless, students who attended urban city schools in this study achieved high grades

and maintained high career goals. The high school factor did not significantly impact the decision of whether or not to pursue a health profession.

Academic Ability

Based on high grades and letters of recommendation required to participate in RAP, all students in this study were considered to have high academic ability levels. Results indicated that all of the apprentices perceived themselves as having high academic ability. The average academic ability score for both groups was 3.9 (1-5 scale). Most students found themselves to be above average in performance. Therefore, there was not a significant difference between the two career choice groups on this variable.

Conclusion

Overall, the *driving forces* of the Career Decision-Making Model had the most significant effect on the decision of whether or not to choose a health profession. No participants in this study remained undecided at the end of their high school experience. The design of the Career Development Model was consistent with results found in other studies conducted with majority populations and with the dominant patterns found in career development theories (Crites, 1969; Roe, 1957; Super, 1957). Many of these studies emphasize personal and social characteristics as driving the career development process. This study also indicated that the RAP experience was a vital and significant *driving force* contributing to minority student career decisions. This factor was supported in the area of experiential learning, overall experience, and peer interaction. Therefore, participation in a precollege apprenticeship program had consequential implications for making career choices; however, *Other Relevant Factors*, such as mentoring, should not be ignored based on these results. The issue of mentoring along with gender, race, high school, and academic ability should be investigated further with this population. This model as a whole

should also be tested on other minority and majority populations interested in pursuing health careers.

Critique of Results

Several cautions must be taken in examining the results from this study and in generalizing these findings to non-RAP program participants. There was a significant difference between the race of students who were interviewed by telephone and those who returned survey questionnaires. This was demonstrated by using Fisher's Exact Test. A significant score of .042 was found to significantly differ between the racial composition of the two groups. Even though the two groups differed on this factor, they were combined to create the study's sample.

This study is also limited by the survey method. Career decision-making is a very complex phenomenon. Using quantitative and survey instrument research can only provide insight into the process. The survey method also involves self-reporting. Although this method is often utilized in social science research, it can still contain some bias. Bias may have also existed in the telephone interviews, where some students occasionally asked for clarification of a question. This option was not available to those students who returned survey questionnaires. Lastly, students were asked to reflect on an experience that took place approximately five or six years prior to the study. The follow-up or after-the-fact technique could also contain some bias, as many people often reflect positively on past events. Without in-depth qualitative analysis, the findings are limited.

Implications for Practice

As we move into the next millenium, programs that bring about academic and career opportunity for racial minorities face intense scrutiny and impending dissolution. Strategies, such as the 10% plan in Texas and the proposed 4% plan in California are moving us toward methods

of "inclusion" that eliminate proactive programs that promote educational and career development through self-exploration and hands-on learning (Kasindorf, 1999). Over the past several years schools, such as Northwestern University, have become more concerned about the lack of minority students, especially students from inner-city schools, who are qualified to participate in "top-tier" institutions of learning (Morganthau, 1995). Yet, recent affirmative action rulings and legislation have threatened to eliminate programs, such as RAP. These programs specifically designed for minority high school students generate increased academic and career opportunity, in addition to "inclusion". These programs promote student success, rather than student selection, and address the needs of students for career advice and mentoring (Malcom, 1996).

At The Ohio State University, the RAP program proved to be a proactive vehicle for encouraging high ability, minority student participation in the health sciences and academia. Instead of addressing this "shortage" of qualified students with a reactive approach, such as lowering admissions standards or focusing on percentages, colleges and universities should consider opening their doors to minority students at the precollege level. Many programs (MED-COR, MEDREP, etc.) across the country have utilized this method and have also found increased success (Davis & Davidson, 1982; Watts & Lecca, 1987). These programs provide opportunities for minority high school students to make more informed career decisions, and through hands-on learning, facilitate a process of self-exploration and self-transformation (Kolb, 1984). Colleges and universities represent a vital link between high school and health career, and precollege apprenticeships can work to promote diversity and enhance opportunity. The benefits and results of these programs should not be disregarded within the current political debate.

References

Association of American Medical Colleges (AAMC), (1995). How Were These Discoveries Possible? Washington D.C: AAMC.

Bauman, R. (1986). Minority students and the health professions: The organizational changes required to attract and retain them. Equity and Excellence, 25. 22-24.

Blau & Duncan (1967). The American Occupational Structure. New York: Wiley.

Davis, J.A. & Davidson, C.P. (1982). The MED-COR Study: Preparing high school students for health careers. Journal of Medical Education, 57. July, 527-534.

DCosta, Ayres G. (1968). The Differentiation of High School Students in Vocational Education Areas by the Ohio Vocational Interest Survey. Athens, Ohio: Ohio University, Unpublished Ph.D. Thesis.

Ginzberg et. al. (1951). Occupational Choice: An Approach to General Theory. Columbia University Press.

Higgins, Connie A. (1991). High school teachers will participate in OSU science program. The Columbus Dispatch. Columbus Ohio.

Hilton, T., Hsia, J.; Solorzano, D. & Benton, N. (1988). Persistence in Science of High-Ability Minority Students. Princeton, New Jersey: Educational Testing Service.

Holland, J. L. (1973). Making Vocational Choices: A Theory of Careers. Englewood Cliffs, N.J.: Prentice-Hall.

Hopkins H.D., Hopkins B.R., & Glass G.V. (1996). Basic Statistics for the Behavioral Sciences. Needham Heights, MA: Allyn & Bacon.

Huttlinger K. & Drevdahl D. (1994). Increasing minority participation in biomedical research and nursing research. Journal of Professional Nursing. 10, (1), Jan-Feb., 13-21.

Isaacson, L.E. & Brown, D. (1993). Career information in counseling and career development. Needham Heights, Massachusetts: Allyn and Bacon.

Kasindorf, Martin. (1999) UC expected to approve 4% plan: University would admit top Calif. grads automatically. USA Today. Thursday, March 18. p.4A.

Kolb, D.A. (1984). Experiential Learning. Experience as the Source of Learning and Development. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Kozol, J. (1992). Savage Inequalities: Children in America's Schools. New York: Harper Collins Publisher.

Malcom, Shirley (1996). Science and Diversity: A compelling national interest. Science 271. March, 1817-1819.

Morganthau, T. (1995). The university: Loosing ground in the scramble for qualified black applicants. Newsweek. April, 30-31.

Office of Minority Affairs (1993). Research Apprenticeship Program 1993-94 Program Guidelines. Columbus, Ohio: The Ohio State University.

O'Neil, J.M. et. al. (1980). Factors, correlates, and problem areas affecting career decision making of a cross-sectional sample of students. Journal of Counseling Psychology. 27, (6), 571-580.

Pizzini, E. L. & Moore (1984). Precollege training programs -- Benefits and directions for hosting institutions. College and University, 60, (1) Fall, 77-89.

Pizzini, E. L. (1985). Improving science instruction for gifted high school students. Roeper Review, 7, (4), 231-234.

Pizzini, E. L. (1986). What research says: Precollege programs: status and summary of research findings. School Science and Mathematics, 86, (1), 64-69.

Ramist, L., & Arbeiter, S. (1986) Profiles, college-bound seniors, 1985. New York, NY: College Entrance Examination Board.

Roe, A. (1957). Early Determinants of vocational Choice. Journal of Counseling Psychology 4, (3) 212-217.

Rovezzi-Carroll, S. and P.A. Fitz (1984). Predicting allied health major fields of study with selected personality characteristics. College Student Journal, 18, 43-51.

Sonnert & Holton (1995). Gender Differences in Science Careers. New Brunswick: Rutgers, The State University.

Super, (1957). The Psychology of Careers. New York: Harper and Roe.

Tuss, P. S. (1994). Quality of subjective experience during a summer science program for academically talented high school students. Unpublished Dissertation: The University of California, Santa Barbara.

U.S Bureau of the Census, CD-ROM, "Income and Poverty: 1993".

Valentine, C.A. (1968). Culture of Poverty. Chicago: University of Chicago Press.

Valverde, L.A. (1980). Development of ethnic researchers and the education of white researchers. Educational Record, 9. (9) October, 16-20.

Watts T.C. & Lecca, P. J. (1987). Minorities in health professions: A current perspective. Journal of the National Medical Association 81, (12), 1225-1229.

Wise, A. E. & Gender, T. (1989). Rich schools, poor schools: The persistence of unequal education. College Board Review, 151. 12-17, 36-37.